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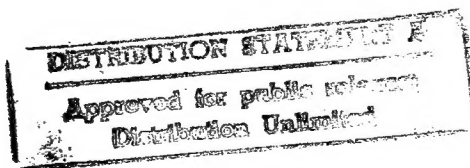
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AEROSPACE, CIVIL AVIATION

European Defense Ministers Propose Joint EUREKA Program

36980256a Paris LE MONDE in French 30 Jun 89 p 44

[Article: "The European Defense Ministers Launch Military EUREKA—Under the Name 'EUCLID'"]

[Text] At a meeting of the Independent European Program Group [GEIP] in Lisbon, the European defense ministers of the member states of the Atlantic Alliance, excluding the United States and Canada, agreed on Thursday, June 29, to launch a joint technological research program for military purposes. This program was inspired by the civilian EUREKA project. It was given the name of "EUCLID" program (for "European Cooperation for the Long-term in Defense") and will be the object of renewed scrutiny in February 1990, at the next meeting of the GEIP.

This French initiative is directed toward European weapons industrialists and is aimed at coordinating their research activities on what the agreement calls "exploratory developments." It involves the development of preliminary weapons models, to experiment with new technologies coming from the research. These preliminary models are an intermediate stage between laboratory research and the development of the equipment as such. Under those conditions, EUCLID should deal primarily with priority fields such as radar technology, microelectronics, composite materials, avionics, artificial intelligence, optronics, simulators, underwater acoustics, space surveillance or "stealth" technology. The experts at Lisbon felt that as of 1990, this European cooperation could relate to research projects estimated at a total of 845 million francs. According to Mr Yves Sillard, general arms delegate, France, in turn, is willing to set aside one quarter of its available credits in these areas.

Airbus Production Programs Outlined

89MI0456 Rome AIR PRESS in Italian
30 Aug 89 p 1610

[Text] The program developed by the Airbus consortium based on orders for 1989 and the following years provides for the production of 220 aircraft in 1995. More specifically, the industrial program provides for the production of the following aircraft: 40 A-300/A-310s, 110 A-320s, and 70 A-330 and A-340 models beginning in 1995. The monthly production rate will therefore increase from 15 to 20 aircraft (the present monthly production rate is 10 aircraft). Airbus Industrie will increase production by using the new plant currently being built in Colomiers, near the Toulouse airport, where the final assembly work of all Airbus and ATR aircraft is concentrated.

Meanwhile, Northwest Airlines and Papua New Guinea's Air Niugini have placed new orders for Airbus aircraft. The leading U.S. company, which had already ordered 100 A-320s in 1986 and 10 A-330s earlier this year, has placed a new order for 20 A-340s and 6 A-330s, with options for another 4 aircraft, reserving the right to choose the model at a later stage. This order is worth $2.7 billion. The first A-340s will be delivered in 1992, whereas delivery of the A-330s is scheduled for 1995. Air Niugini has ordered only one A-310/A-300 to be used jointly with a similar aircraft operating on the carrier's regional routes. The new A-310/A-300 will enter service next year. Air Niugini is currently operating the Port Moresby-Hong Kong route with Cathay Pacific. Connections between the two cities had been suspended for the last 5 years.

Italian Company Introduces Wind Tunnel Robot System

89MI0459 Rome AIR PRESS in Italian
23 Aug 89 p 1558

[Text] The new "Walke Traversing System" has started operating in Aermacchi's wind tunnel in Venegono. The system is a robot with three degrees of freedom which is used to position a probe or body in the tunnel by using remote control. This piece of equipment consists of two carriages running right angle tracks that can be operated by electric cylinders powered by stepping motors. A programmable control unit allows for remote control movement, and establishes sequences, movement, and velocity. The entire system can "communicate" with the main computer which supervises the execution of tests and gathering of results. The instrument has a very wide field of application. It is most obviously and commonly used to determine the local flow characteristics of the trials on the models used in the tunnel. By using different types of probes, total pressure, local direction, static pressure, turbulence, or vorticity can be tested. Another possible use is "store gridding" which involves attaching the model of an external load to the end of the robot's arm and then using a small internal balance to measure aerodynamic loads based on its position in reference to the aircraft. The system has already been used to position mock-ups of the supports normally used in static tests, with respect to the model, and obtain more precise results on the effects of interference. An Aermacchi press release points out that the availability of this new piece of equipment is another, significant step ahead for Aermacchi's wind tunnel in providing a valid instrument for research in complex aerodynamic fields.

Spanish Space Activities Discussed

89AN0286 Paris CPE BULLETIN in French
Jul 89 pp 53-55

[Article by Gerard Tsalkovitch: "Spain's Position Within the European Space Agency"]

[Text] CDTI And The National Space Program

The Center for Technological and Industrial Development (CDTI) manages Spain's participation in European

space programs. The center, part of the Ministry of Industry and Energy, also negotiates industrial revenues from European Space Agency programs to Spanish companies.

To help Spanish companies reach a technical level enabling them to participate in space projects, the National Science and Technology Research Plan, which was set up in early 1988, provides for a CDTI-managed National Space Plan. The plan's budget was 1.9 billion pesetas in 1988 and will be 2 billion pesetas in 1989.

In conjunction with the National Space Program, CDTI has financed 28 projects whose budgets total 3,300 million pesetas; 50 percent comes from the National Plan, 20 percent from the Ministry of Industry and Energy, and 30 percent from participating businesses.

Implementation and Amount of Spanish Funding Levels

CDTI funding levels were determined at the Hague summit where Spain supported France's position. The breakdown of Spain's contributions to the financing of the various programs is as follows, as a percentage of the total:

- Ariane 5: 3 percent
- Hermes: 4.5 percent
- Columbus: 6 percent

This represents a total investment of 207 billion pesetas for the period 1988-2000; the contribution for 1989 is scheduled to be 8.2 billion pesetas (Fr 440 million).

At present, total industrial revenues from Agency programs to Spain equal 98 percent of Spanish investments.

Hermes

Spain's contribution to the Hermes budget was revised downward (to 4.5 percent from the 5 percent determined at The Hague) because industrial revenues had not reached the expected level. In addition, Spain would like to take over 20 to 25 percent of the development of the ground control center; it is presently responsible only for the simulation subsystem, which represents 13 percent.

One example of Spanish participation in this program is the work done by CRISA, a subsidiary of ABENGOA and Matra-Espace. This company will help design various spaceship communication devices, such as interfaces between various subsystems and central computers, or control panels.

Another ineresting example of Spanish participation is the work of the Almeria solar platform: The first thermal skin prototypes for the wings were successfully tested there in late 1988.

Ariane V

As regards French-Spanish relations, this program is developing very well; a contract that CDTI was interested in was finally awarded to CASA. It concerns construction of the support for the third rocket stage, which consists of a "honeycomb" structure with a carbon fiber skin.

Furthermore, it should be recalled that CRISA was awarded the contract for developing sequential electronics for the launcher. This contract represents 1 billion pesetas for the first phase of the project, and, in the second phase, CRISA expects it to represent contracts worth 700 million pesetas annually for 20 years in the second phase.

ESA's Scientific Activities

These activities are defined by the Horizon 2000 program which includes projects such as the ISO infrared telescope satellite; the Hipparcos astrometry satellite, whose construction involves the University of Barcelona; the International Program for Solar and Terrestrial Physics (ISPT), which plans, in particular, to implement the SOHO observatory; and the CLUSTER magnetosphere observation program.

Spain participates in these projects through 40 Spanish scientists working at the European Space Research and Technology Center (ESTEC) in Noordwijk [Netherlands].

Moreover, a Spanish military engineer (Andres Ripoll) was chosen as director of the training center for ESA astronauts in Potz-Wanhm (FRG).

Examples of Projects Approved by CDTI as Part of the National Plan

Company	Project	Budget	CDTI budget
in million pesetas			
CASA	Robotics laboratory	100	50
CASA	Optical measurement system	190.2	95
CRISA	Management of telecommunications networks	210	105
CRISA	Data management system on board spaceships	140	69
Empresarios Agrupados	Simulation of environmental control and life support systems in spaceships (ECOSIM)	83.7	58.6
ENTEL	Expert system for maintenance of satellite tracking station systems	84.7	42.3

	Examples of Projects Approved by CDTI as Part of the National Plan (Continued)		
Company	Project	Budget	CDTI budget
ENTEL	Satellite-based data communication systems	79	39
GMV	Development of software for satellite control and operations and for space transport systems	214.9	107
ICI	Outer space signal processor	89	44.5
INISEL	Development of a millimeter-band power amplifier	312	154.8
ISEL	Satellite and microterminal communication network	110	70
ISEL	Organization system for spaceship control centers	130	77
MIER	Development of elements of the ARAMIS payload	152	76
NTE	Measurements of physiological parameters on living organisms	145.7	72.9
RYMSA	Research and development of passive radio-frequency elements	159	79.9
SENER	Airlocks for manned space missions	90	45
SOFEMASA	Flexible software design environment	89.4	44.7
SPHERIC	Simulation and test subsystems for the Hermes flight control center	134.2	47.2
Telecom y Control	Development of radio frequency components and subsystems for space applications	314.3	100

BIOTECHNOLOGY

Italy: Research Center Planned for Sardinia

89MI0431 Brescia BIOTECH in Italian
Jul-Aug 89 pp 16-17

[Article by Angiola Bono: "Great Success for the Sardinia Symposium and the Presentation of the Center"]

[Excerpts] The Sardinia Symposium on Advances in Biotechnology Control of Gene Expression, organized by the Sardinia Regional Authority and the University of Sassari and held at the Capo Caccia Hotel in Alghero on 18-23 May, was definitely one of the most informal and brilliant conferences on molecular biology to be held in Italy in recent years. [passage omitted]

Another positive aspect of the symposium that came as a surprise was the presentation of the Training and Research Center in Genetics and Molecular Biology. This center is being constructed—in fact, some parts are almost ready—near the hotel at Tramariglio, in the area of the old abandoned prison which will be incorporated into the center. [passage omitted]

The New Center

During one of the intervals between sessions of the symposium, the participants were invited to see the work being done on the new research center, which is due to begin activity next year. In a small amphitheater overlooking the sea, which will be used as an open-air classroom, Prof Marcello Siniscalco enthusiastically presented the new project. Sponsored by the Ministry for Southern Italy, the Ministry of Scientific Research, the CNR [National Research Council], the University of Sassari, and a group of private parties who have formed a consortium for the purpose, the center will consist of two independent units: a molecular genetics institute and a laboratory for applied biotechnology.

The research will be divided into four areas: the first area will deal with the study of human molecular genetics, and will be headed by Professor Siniscalco, who has been doing research on population genetics in Sardinia for the past 20 years; the second area will deal with cellular biology and gene expression; the third area will cover immunobiology; and the fourth area will be concerned with applied biotechnology. The laboratories will be in separate prefabricated blocks.

The training program will include PhD courses, long-term courses for young people wishing to acquire both theoretical and practical experience in the field of biotechnology, and short courses for scientists and engineers on new techniques in applied biotechnology. The prospects look good for the center; apart from its enchanting location and the number of well-known Italian and foreign scientists who have become involved in the establishment of the center as a result of the work of

Professor Siniscalco, the region of Sardinia's autonomous status means that many of the bureaucratic and financial procedures for the completion of the center are simplified.

The Ministry for Southern Italy has already allocated 14 billion lire for constructing laboratories, purchasing the required instrumentation, and hiring personnel in the first 3 years. A separate budget will be available through the CNR, which will fund research by means of the usual system of grants, while the training program will receive support from organizations such as the EEC, WHO, and NIH.

Since the need for collaboration between the community and the center is even greater in Sardinia than elsewhere—because of the major program underway on the molecular genetics of the population—seminars and courses have also been planned to channel scientific information toward the general public. These will follow the example of courses organized for the local community by the U.S. Cold Spring Harbor Laboratory, acting through the DNA Learning Center and the Science Exhibition.

The presentation aroused a good deal of curiosity, and was well received by the participants.

COMPUTERS

ESPRIT Parallel Computing Projects Selected

89AN0330 Brussels EUROPE in English
14 Sep 89 pp 13-14

[Report on EC research: "Within the Framework of the ESPRIT Programme, the Commission Approves 55 'Parallel Computer Architecture' Software Projects, High-Level Configurations Requiring Advanced Know-How—3.3 MECU in Credits"]

[Text] The Commission's spokesman announced that 55 proposals for projects exploiting parallel computer architectures have been selected by the Commission and approved for contract negotiation. This represents 30 percent of the 1988 submissions by universities, polytechnics and research centers following the competitive call for proposals, issued in February 1989, for a Parallel Computing Action within the framework of the ESPRIT programme. The Action will encourage participants to strengthen their activities in the development of parallel computing technology, with the selected proposals covering the areas of basic software, programming tools, environments and applications. The Commission has allocated ECU 3.3 million in funds. Participating organisations, which must already possess expertise in parallel computing, will be offered a contribution of up to 100 percent of the cost of equipment. Participants will be required to attend twice-yearly workshops to disseminate the results of their work.

One of the ESPRIT programme's major objectives is the development of advanced computer architectures based on highly parallel processor configurations. Results from European R&D have recently led to the greater availability of commercial systems based on parallel computers, but such configurations need advanced software expertise to exploit their high degree of parallelism to the full. ESPRIT's Parallel Computing Action is designed to help develop the necessary skills and to push forward the state of the art in applying them. The initiative aims to catalyse better interaction between European computer development and software engineering activities to encourage innovative contributions from academic and research organisations and to build up practical awareness of parallel computing among undergraduates and graduates for subsequent transfer into industry.

The list of the organisms responsible for the projects selected by the Commission includes:

• Several universities: Madrid, Berlin, Thessalonika, Darmstadt, Athens, Nuernberg, Frankfurt, Odense, Bologne, Mons, Karlsruhe, Cologne, Eindhoven, Bari, Louvain, Gent, Brussels, Sheffield, Dublin, Genoa, London, Rennes, Bristol, Nijmegen, Aalborg, Reading, Bremen, Lisbon, Twente, Kaiserslautern, Strasbourg, Turin, Rome, and some regional universities: Catalonia, Franche-Comte, Wales-North, Ulster;
• Research centers and institutions: CNR (Italy), IFSIC (France), INESC (Portugal), CSIC (Spain), Vidal-Naquet Laboratory (France), TNO (The Netherlands).

It should be stressed that organisms from three EFTA [European Free-Trade Association] countries also answered the call for bids.

In addition to the 55 projects selected for direct participation in this programme, the Commission decided that 20 other organisms would be invited to take part in the evaluation workshops. The spokesman underlined that expertise in parallel computing, the strength of the research group, the potential for disseminating and applying research results, the cost/benefit of the proposed project and the capacity for training were taken into account during the proposal evaluation process. The projects selected are complementary and cover the three basic technical domains of run-time environment, processing tools and applications. The T800-INMOS transputer (resulting from previous work within ESPRIT) is at the basis of most of the parallel processing machines used as research vehicles in the projects selected.

The Commission will make available up to 100 percent of the cost of purchasing equipment from Community suppliers. ESPRIT's Parallel Computing Action will provide a further stimulus to an important, strategic area of information technology in which Europe is currently a world leader.

FRG University Receives Siemens Supercomputer

[Article: "Siemens—A Supercomputer for the University of Karlsruhe"]

[Text] A Siemens VP400-EX vector computer has been installed at the University of Karlsruhe. With a maximum computing power of 1.7 gigaflops (billion floating-point operations per second), it stands out as the world's fastest currently available vectorial computer with monoprocessor architecture.

It has a 512-Mbyte working memory and an access time of only 55 nanoseconds. In the case of numerous mathematical simulations, this memory permits a transition from bidimensional to tridimensional models. Hence, the results obtained are so reliable that expensive experiments are often unnecessary.

At the University of Karlsruhe, the VP400-EX vector processor is used for research in the following areas, among others: geoscientific disciplines, the environment, offshore drilling techniques, steam and gas turbines, high-speed trains, and molecular modeling. The industrial sector also has access to the supercomputer. Through a collaboration between the University of Karlsruhe and Siemens AG, a European center for supercomputer applications has been established in Karlsruhe. It will offer highly optimized standard software and will also help to open up new prospects in the field of vectorial computers.

Italy: Turin's Advanced Calculation Role Growing

Olivetti Artificial Intelligence Center

[Article by Piero Scaruffi, head of the Olivetti Artificial Intelligence Center: "The New Spring of Artificial Intelligence"]

[Excerpt] [Passage omitted] The Olivetti Artificial Intelligence Center (OIAC) was established in 1985 at Cupertino and was subsequently transferred to Ivrea. The first question OIAC had to answer was the following: "Why should we be involved in AI?" Over time, we have found at least three answers to this question. The first, obviously, is that sooner or later there will be an attractive AI market, and Olivetti intends to enter this market in a big way. This means that the Ivrea computers (not only the personal computers but also the minicomputers and mainframes) must be provided with the software environment necessary for AI applications (in the AI field, this would be the equivalent of Cobol and Office Information Systems). This alone, however, would not be sufficient to make this investment any different from many others of its kind.

The second reason is that AI can provide Olivetti with instruments to improve the quality of services and increase productivity. For example, expert systems can be used to increase the number of specialists in diagnostics, configuration, and sale of products. Jobs that traditionally required years of training can be "constructed" and then multiplied thanks to AI. The result is equivalent to the immediate hiring of hundreds of qualified technicians.

The third, and probably most important, reason why Olivetti believes it is worthwhile to be involved in AI is that we have realized that artificial intelligence can change the way in which a computer behaves. Today's computers do not understand what the user is trying to do, they do not collaborate, and are totally passive. In addition, they oblige the user to express himself in an unnatural way, using methods such as "commands" and "menus" which, however effective they may be, still require mental effort, and can also give rise to errors.

AI makes it possible to provide all existing software with a form of intelligence that enables the software to communicate with the user naturally and to collaborate with the user. In particular, it is possible to provide any type of existing software with an interface that understands commands expressed in fluent Italian. An automatic "teacher" can be provided for any software package so the user can learn how the package works without having to refer to manuals. An on-line "help" function which answers the user's questions at any moment can also be added to any package. In this way, we have transformed the computer into something that is decidedly closer to our idea of "intelligent." A computer that can understand what we say without the need for a particular syntax, explain what it can do, and help us when we cannot make it understand an operation is what we call an "intelligent computer."

Olivetti's goal is to provide computers with an "intelligent" look. This is, to a certain extent, the focal point of the artificial intelligence program. We are now starting to see the first practical results of this work on a large scale. Special mention should be made of the expert systems developed by Olivetti for large-scale use, such as the system developed for the Credito Italiano bank, which advises the user on granting credit to professionals.

There are two basic types of expert system. On the one hand, there is the expert system designed to operate in a specific environment. There is only one copy (or a limited number) of this expert system, but the advantages it offers are immense. This expert system is used for the control and diagnosis of industrial equipment. It makes sense here to propose an expensive solution (a dedicated minicomputer), because optimal response times are crucial in this case.

On the other hand, there are expert systems designed for large distributed organizations in which the ability to make decisions is also required at the peripheral levels.

The systems used in this case must operate at all of an organization's locations (for example, at every bank counter). As this system would be installed in all locations of an organization, the solution must be inexpensive. This means that it must be based on the personal computer, even at the risk of detracting from performance.

The work of OIAC is also an innovative experiment in terms of organization. The Olivetti AI center is an organization which is active in the various phases of artificial intelligence, from research to products and applications. The Cupertino center maintains contacts with leading American research centers, from Stanford to CalTech, and from Yale to MIT. Between Cupertino and Ivrea the new technologies are transformed into products. Finally, applications are carried out by the Ivrea center. The whole process takes place without involving other company structures. This guarantees the maximum integration of the first and final phases (basic research and applications). In most cases, these phases remain so far removed from each other that they ultimately constitute an antithesis. The mobility of the staff, which may be part of a Stanford research group one day and visiting a customer the next, means that company personnel are extremely qualified in terms of both theoretical knowledge and practical requirements.

The organizational model of Olivetti's AI is completed by two forms of complementary partnership. The first is the partnership created with suppliers to jointly develop high technology with separate user rights. Numerous projects have been carried out in collaboration with American companies of various sizes and types (from the tiny Digitalk company to the CalTech giant). These joint research ventures make it possible to import the culture on which a given product is based, rather than the product alone. Taken as a whole, they constitute an extensive reference network within the AI community at the world level.

The second form of partnership is the one mentioned earlier that is established with large-scale users. The idea is not so much to place a certain number of AI systems on the market, as to create in the user all the premises for spreading artificial intelligence. There is also another, equally important, goal: to learn from the user which form of intelligence is really needed, and how this intelligence should be packaged. Therefore, the projects for the expert systems mentioned earlier are more than just simple software projects.

The goal of our technical and organizational efforts is to acquire a leading position in a sector that will become very important in company strategy in the near future. We can state without false modesty that nobody, including ourselves, has the solution at present that will make it possible to transform AI into a mass commodity. The development of expert systems is still to a large extent a "craft" activity, requiring great expertise and, above all, common sense. This is perhaps where the Europeans' strength lies. Although not as strong as the

Americans and Japanese in many of the "copying" industries, they excel in areas in which creativity and customized design are needed.

The industrial era of AI has yet to begin. Operators in the sector are currently attempting to understand which infrastructures must be created to make the benefits now enjoyed by a small number of users available on a large scale. To do this it will be essential to construct models that are very different from those abused in today's EDP [electronic data processing].

Supercomputer Acquisition Proposed

MI890387 Turin MEDIA DUEMILA in Italian Jul-Aug 89 pp 73-74

[Interview with Vittorio Beltrami, president of the Piemonte Regional Authority: "Turin as Center of Supercomputing Network"]

[Text] The Regional Authority of Piemonte has requested financing to acquire a supercomputer in Turin under the provisions of the finance bill. How did this decision come about? The question was put to Vittorio Beltrami, president of the Regional Authority.

Beltrami: The idea originally came from the university, the polytechnic, and industry, which brought to our attention the need for Turin to have supercomputing facilities—not simply to respond to the most pressing research requirements, but also to keep abreast of new technologies and leading-edge research.

MEDIA DUEMILA: Turin is already linked to the CINECA [Interuniversity Consortium for Automated Computing] supercomputer in Bologna, as well as to major computing structures in Genoa and Milan. Is it really necessary to have a new supercomputer?

Beltrami: The real problem of a local supercomputing structure is that it represents the only way to create a scientific culture for advanced supercomputing problems. Not today, but with a view to the future, we must do everything necessary to ensure that Turin and the Piemonte region are not excluded from the major cultural, scientific, and economic circles, which are very closely linked with the future of data processing.

MEDIA DUEMILA: Is this why Turin has presented itself as a candidate for the purchase of the supercomputer?

Beltrami: I would rather say that Turin has presented itself as a candidate for the Ercoflax network center, the supercomputer network promoted by the EC. Turin already has an important tradition of industrial research, and stands a good chance of being awarded this role by Europe—but only if it already possesses a supercomputing structure capable of producing programs.

MEDIA DUEMILA: Will this not be an extremely expensive operation?

Beltrami: According to the finance bill, 50 billion lire has already been allocated to the Ministry of Scientific Research. This should be repeated in the following years, for the purpose of providing Italy with a network of supercomputing centers. At this point, the regional authorities felt it would be right to request that the region of Piemonte, with its strong scientific tradition, be included in this project. We are not planning to enter into commitments that are beyond our means. We will do our share to strengthen and consolidate the interconnection between the public and private sectors which has been successfully tested recently. In this way the 15 billion lire allocated by the finance bill for technological innovation will generate numerous initiatives. Finpiemonte has been commissioned to carry out a study of the project.

MEDIA DUEMILA: What has been done in concrete terms?

Beltrami: A meeting was attended by universities, the local and provincial authorities, the Chamber of Commerce, Federpiemonte, the Industrial Association of Turin, various public research centers, the National Research Council [CNR], and the Galileo Ferraris Institute, as well as by FIAT Auto, the FIAT research center, the Donegani Institute, Aeritalia, and SIP [Italian State-Owned Telephone Company]. A general agreement on the project and a readiness to provide financial contributions emerged from the meeting. A request has been submitted to the ministry to obtain financing through the CSI [Computer Study Center], which has the features of a public research organization as required by ministerial decree, as well as for the university, polytechnic, CNR, Federpiemonte, the business community, the local organizations, and concerned parties.

MEDIA DUEMILA: How will the project be managed?

Beltrami: We are thinking along the lines of a consortium where the parties involved can participate both in the investment phase and in the final use stage. This will safeguard the investment characteristics as well as service to the community, enabling us to operate in a dynamic and businesslike way.

Computing Centers Described

MI890387 Turin MEDIA DUEMILA in Italian Jul-Aug 89 p 75

[Text] Turin has six computing centers which are discussed in this article:

The CSI [Computer Study Center]-Piemonte Computing Center This center uses IBM and IBM-compatible computers and Digital computers of the VAX 780 type to serve large-scale users (companies and organizations) through a network consisting of approximately 1,000 links. For universities, there is now an NAS 9160 equipped with a vector system, to be supported by an IBM 3090. The center also has a laboratory structure with work stations specializing in artificial intelligence, image analysis, molecular graphics, and symbolic calculus.

The Turin Polytechnic Computing Center This is composed of a cluster of Digital computers of the 880 type operating in a VAX/VMS environment. This links an appropriate number of work stations in the faculties of engineering and architecture which are linked on a local Ethernet network and are connected to external systems through the Itapac, Arpanet, and Earnet/Bitnet networks. The center satisfies a large part of the departments' basic computing requirements for research and the teaching requirements for undergraduates and students working on their theses.

The Computing Center of the Turin Institute of Nuclear Physics This takes the form of a local computing center using Digital computers of the VAX 8600 cluster type and connected on a local Ethernet network. This is connected on the Infnet network to all the other INFN [National Institute of Nuclear Physics] centers and national and international computing facilities. This center is used for the interactive computing requirements of the INFN's Turin branch.

The Computing Center of the Arts Faculties (CISI) Although only marginally involved in the use of vectoral calculus, this center should be mentioned. With its IBM 4341 computer operating in VM:CMS, which will be connected on-line with CSI-Piemonte's 3090, it constitutes a cultural reference point for the requirements of the arts faculties.

The CNR [National Research Council] Computing Center in Turin This is a local center acting as a node for the National Research Council's network. It responds to the needs of several laboratories in the Piemonte region, and also provides technical support for accessing external computing centers (primarily CNUCE [National University Center for Computing]).

The Vector Computer at FIAT Auto FIAT Auto is installing a Cray X-Mp-14Se computer for company requirements only. The company expects to have massive requirements in the future for additional high performance computing, particularly for its research center. The company has already informally examined the possibility of connecting its own supercomputer to the supercomputer installed at CSI.

ENERGY

EC Clean Air Agreement for Automotive Industry

Details of Agreement

36980254 Paris LE MONDE in French
11-12 Jun 89 p 19

[Article by Marcel Scotto: "European Agreement on Small Clean Cars—A Difficult Compromise Among the Twelve"]

[Text] Luxembourg (European Communities)—On Friday, 9 June, the ministers for environment of the EEC reached an agreement on antipollution standards for small cylinder cars (less than 1.4 liters). The emission standards will be compulsory as of 1 July 1992 for the new models, as of 31 December for the other models. Between now and this deadline, the member states are allowed to grant tax advantages to purchasers of vehicles which respect the American standards.

"Ouf, finally an agreement," exclaimed Mr Brice Lalonde at the end of the working session for the Twelve. It was hard to know whether the satisfaction of the French secretary of state for the environment was a pretense or real. The fact remains that the Luxembourg agreement did not go in the direction of the strategy desired by some of the builders of Europe.

In the face of the pressure of public opinion relayed by the European Parliament and the Brussels Commission, Peugeot and Renault, but also Fiat and British Leyland, had for better or worse rallied to the idea of American standards by 1993. The whole idea being to preserve the vital element: save time to develop new technologies (low combustion engines, for example), in order to avoid equipment manufactured by foreign competitors (specifically German, American and Japanese). The only procedure currently in existence on the market able to meet stricter standards is the triple tracked electronically equipped catalytic converter.

Today, that objective appears seriously compromised. France, Italy and the United Kingdom finally accepted that national subsidies be given from now on to motorists who have anticipated the obligation required 3 years from now. Once again, the weight of the Federal Republic of Germany made the decision. By announcing in late April that his government had decided to grant tax incentives, Chancellor Kohl thwarted the scenario anticipated by Paris, Rome and London.

The Commission Gave In

Surprised by the intransigence of West German Minister Klaus Tofper, the European Commission improvised and, finally, gave in. The Commission which until very recently, in response to the tax advantages granted by the Dutch government, stated that such advantages ran the risk of "fragmenting" the market, has changed its arguments completely. "What counts," explained Carlos Ripa di Meana, commissioner in charge of this file, "is for the subsidies to be placed at the community level."

Beyond the convoluted formulas peculiar to the community jargon, the fact remains, as Mr Lalonde admitted, that cars equipped with catalytic converters will not be any more expensive than those without. Faced with this choice, the decision will obviously be easy. All the more so as lead-free gasoline, the only fuel which does not deteriorate the catalyzer, is sold cheaper than the super.

Fragmented Market

In addition, whether we like it or not—this is admitted privately within community circles—, the European car market will be fragmented at least until 1 July 1992. With the Dutch already implementing subsidies, and the Belgians and the Germans having announced similar measures, this makes at least three markets which will make a distinction between clean cars and those which are much less so. Denmark going it alone, has decided to make the American standards compulsory on its territory as of 1 October 1989.

Independently from the market unity dear to all at the level of talk, there is the industrial problem faced by the French, the Italians and the British. In their virtual monopolistic position in Europe, the German manufacturers of catalytic converters suddenly find their outlets substantially expanded.

Obviously, the proximity of the European elections having helped, the industrial interests weighed little in the balance as against the ecological concerns. But after all, as Lalaonde noted, "some manufacturers from Southern Europe have been slow, and their strategy is wrong."

This attitude is all the more difficult since the saga of clean cars is far from over. The Commission intends to formulate a new project aimed at toughening the standards foreseen for medium sized cars (a capacity between 1.4 and 2 liters), which will make the catalytic convertersindispensable while the current emission standards do not make them obligatory.

However, Lalonde did get the commitment that "the Commission will pay special attention to the problem of speed limits." In the opinion of the French minister, high speeds multiply the emissions of carbon dioxide, which is responsible for the "greenhouse effect." Today, the FRG is the only member state of the Community not to impose speed limits on the expressway.

[Article by Marcel Scotto: "The Reactions: Satisfaction at Renault, Silence at Peugeot"]

[Text] The state owned Renault company has declared itself "satisfied" with the agreement signed in Luxembourg. Having acknowledged that it would be necessary at some point to adopt tougher antipollution standards, it had requested that they be set once and for all and hoped to have the time to prepare for them. It feels that the set deadlines—1 July 1992 for new models and 31 December 1992 for older model new cars—will provide the manufacturers with ample time to adapt to the new standards.

There was no reaction from Peugeot even though Mr Calvet, owner of the private group, had strongly opposed the toughening of antipollution standards. On the other hand, the British federation of car manufacturers and dealers [SMMT] feels that the cost of small cylinder cars could increase by £300 to 800 (approximately 3,000 to 8,000 francs) as a result of the newly adopted standards. "We are satisfied that the new standards are compulsory," they said at the federation, while a spokesman for Austin-Rover stated that the decision of the Twelve was exactly what was needed because "it put an end to the uncertainty."

In the immediate future, cars with a liter capacity of more than two will be equipped, as of 1 October 1989, with catalytic converters which require the use of lead-free super gasoline. In France, this fuel will debut at service stations as of 1 July, at a price per liter approximately equivalent to today's super, due to the tax reduction of 41 cents per liter.

LASERS, SENSORS, OPTICS

France: New Lab for Laser Research Announced

[Article: "Interaction Lasers-Materials: Joint CNRS-ETCA Laboratory"]

[Text] Paris—A communique made public on 19 June announced that the National Science Research Center [CNRS] and the Central Technical Arms Establishment [ETCA] have decided to set up their first joint laboratory whose laser activities may lead to military and civilian applications.

Several teams from CNRS and ETCA, an establishment of the General Arms Delegation, were already cooperating in the area of laser-materials interactions. The communique specified that as a result of an agreement signed on 15 June by the directors of the two bodies, Messrs Francois Kourilsky and Pierre Capion, their activities, which deal with subjects which are "very much state of the art and necessitate a concentration of resources and equipment,"

will henceforth be rearranged within this new Laboratory for the Application of Powerful Lasers [LALP]. (The LALP is located at the ETCA, 16-bis, avenue Prieur de la Cote d'Or, 94114 Arceuil.) The CNRS and the ETCA will join efforts more specifically:

—to study the basic processes which govern the interaction between powerful lasers and materials of low and medium flow (flow allowed by atmospheric transmission): physics of the interaction and characteristics of plasmas, induced metallurgical transformations, treatment of the materials, photochemical effects;

—to transfer the knowledge acquired during this basic research to applications of an industrial or defense nature;

—to welcome and stimulate foreign national teams using these resources and to participate in teaching and training activities through research in the use of powerful lasers;

—to pursue and increase European cooperation activities initiated within the framework of the BRITE and the EUREKA programs.

The LALP has three continuous lasers at its disposal for this research: CO2, 1KW, 5KW and 25KW, the latter being the most powerful source available in France. In the near future, the laboratory, which already brings together about a dozen researchers and engineers, will also use a large pulsed laser, unique in the country.

MICROELECTRONICS

Italy: SGS-Thomson To Produce Transputers

[Article by Gabriella Cattaneo: "SGS-Thomson Aims at 'Parallel Chips']

[Text] SGS-Thomson, the Italian-French joint venture working in the field of semiconductors, has decided to penetrate the rich market of the latest generation of microprocessors (32 bits). Without economizing its resources, SGS-Thomson will launch the only innovative European technology in this area, the transputer, on the world market. The transputer is a parallel architecture microprocessor invented by Inmos, a British company acquired by SGS-Thomson last April. This was stated yesterday in London by SGS-Thomson's managing director, Pasquale Pistorio, who announced the launching of the new T400 transputer with a 10 MIPS (millions of instructions per second) capacity, priced at $20. This is less than one-fifth the cost of the most widespread rival products ($120-130). The prices of the entire transputer generation will be reduced by 40-70 percent and will soon be available from SGS-Thomson's worldwide commercial network. As a result of its price/performance ratio of $2 per MIPS, the transputer will have

a new range of high sales volume applications primarily in office automation, telecommunications, and control functions.

Transputers had previously been limited to advanced applications in the military sector or in university research.

SGS-Thomson was established in 1987 following the merger of the Italian and French companies, and had a $1.2 billion sales volume in 1988. This initiative is part of the strategy to keep up with the Japanese and American giants. Pistorio maintains that in addition to microprocessors, there are two other key areas of growth for the company, the production of DRAM [dynamic random access memory] memory, and a stronger commercial foothold in Japan. In Pistorio's opinion, SGS-Thomson's sales volume in 1989 is expected to increase by 10 percent over last year. According to Data Quest, the market for microprocessors, which reached a sales volume of $1.37 billion in 1988, will reach $3.93 billion in 1993.

A few days ago the group announced the takeover of Siemens' microwave semiconductor operation (excluding activities on gallium arsenide chips), whose sales volume totals approximately $20 million. Pistorio explained: "This was an interesting opportunity to be seized; unlike Inmos, it was not a strategic acquisition."

Mr Paul Strezelecki, Inmos's new marketing director, stated that Inmos is a sound company although the heavy investments that have been made will reduce profits. Factories have been expanded and a new production line, designed primarily for the military sector, is being opened in the United States. In 1988, Inmos' sales volume totaled approximately $122 million, compared to $76 million in 1985 when the transputer was launched. Thorn-EMI, the previous owner, sold its controlling interest in the company in return for 10 percent of the capital of the holding company, SGS-Thomson Microelectronics Nw. The remaining 90 percent is controlled by another holding, with equal shares held by IRI-Finmeccanica and by the Thomson-CSF Group.

Inmos also announced the launching of the next generation of transputers within 18 months. This will be the T900 that is expected to have more than 100 MIPS capacity and remain compatible with previous transputers. The company also announced the development of software packages to facilitate the integration of its chips into the operative systems used by major producers. The company's objective is not to establish itself in the "brain" of personal computers and workstations, which are dominated by Intel and Motorola architectures along with the various Risc options, but rather to conquer the rapidly expanding market of peripherals and control chips.

1987-88 World Classification of Semiconductor Manufacturers—Sales Volume in Millions of Dollars					
1988	1987	Company	1987 Sales Volume	1988 Sales Volume	Percentage Growth 1988-87
1	1	NEC	3368	4543	34.9
2	2	Toshiba	3029	4395	45.1
3	3	Hitachi	2618	3506	33.9
4	4	Motorola	2431	3035	24.8
5	5	Texas Instruments	2127	2741	28.9
6	6	Fujitsu	1801	2607	44.8
7	10	Intel	1491	2350	57.6
8	9	Mitsubishi	1492	2312	55.0
9	11	Matsushita	1457	1883	29.2
10	7	Philips	1602	1738	8.5
11	8	National	1506	1650	9.6
12	13	SGS-Thomson*	950	1197	26.0
13	12	AMD	986	1084	9.9
14	14	Sanyo	851	1083	27.3
15	18	Sharp	590	1036	75.6
16	19	Sony	574	950	65.5
17	17	Oki	651	947	45.5
18	23	Samsung	327	905	176.8
19	15	AT&T	802	859	7.1
20	16	Siemens	657	784	19.3
*Inmos included—Source: Data Quest					

ESPRIT II Projects Described

IC Fabrication Software

*89AN0343 Paris FRENCH TECHNOLOGY SURVEY
in English Sep 89 p 1*

[Article: "CNET Participation in the STORM Project"]

[Text] STORM (Simulation of Research Methods) is a four-year project falling within Phase II of the ESPRIT programme which began on 1 February 1989. The project aims to develop new physical models and a computer environment for optimising submicronic technologies, in close liaison with the developments in CMOS [Complementary Metal Oxide Semiconductor] and bipolar technologies for the microelectronics industry and with other ESPRIT projects such as Spectre, Tip Base, Tip IDPS, etc.

The programme budget is ECU 14 million (15 million dollars), 50 percent funded by the CEC [EC Commission] for 98 man-years (of which CNET will provide ECU 3 million and 22 man-years).

The CNET (National Telecommunications Research Center) participation in the project will mainly concern:

- certain production stages using the TITAN-V simulator (diffusion of impurities and point defects, localised oxidation, planarisation),
- sensitivity studies for the different technological parameters,
- digital techniques (grids and multi-grids),
- the validation of simulators using technologies developed at the CNET.

The CNET is coordinator of the project involving the following partners:

industry: SGS-Thomson (Grenoble), Agrate (Italy), Plessey (UK);

R&D Laboratories: Fraunhofer Gesellschaft at Erlangen and Berlin (FRG), IMEC in Louvain (Belgium), and NMRC in Cork (Ireland);

University laboratories: University of Bologna and CNR/LAMEL (Italy).

Two other French organisations—ISEN in Lille and the CISI in Grenoble—are also associated with the project as subcontractors to CNET.

Thus, twelve laboratories from six countries of the European Community are cooperating in this project, which should lead to the production of software to assist in fabrication of integrated circuits.

VLSI Chip Production

*89AN0344 Paris FRENCH TECHNOLOGY SURVEY
in English Sep 89 p 3*

[Article: "IDPS: An Ambitious Project for VLSI Circuits"]

[Text] The IDPS project is one component of the European ESPRIT II programme. Its aim is to build highly complex, customised circuits in a much shorter time than presently possible. In particular, the initial phase of the project, due to be completed in 1991, has the objective of building VLSI chips containing 1 million transistors from specifications within a period of one month.

A number of European firms are collaborating in the project. The Bull group is responsible for the entire design methodology and the CAD techniques. Bull's Pregnana center in Italy is closely linked to this part of the project. The technology used will be of the submicronic CMOS type and the design technique will be based on the use of a cell library.

This is an ambitious project of worldwide importance. In the second phase, due to be completed in 1993, it is planned to build a chip containing 3 million transistors, with the same objective of a construction time of 1 month.

SCIENCE & TECHNOLOGY POLICY

EC Presents New Framework Program

*89AN0309 Brussels EC INFORMATION MEMO in
English No P-45, 27 Jul 89 p 1-3*

[Article: "The Community's Research Strategy: ECU 7.7 Billion for the Period 1990-1994"]

[Text] The Community's research strategy during the next 5 years will be concentrated along three main lines in order to take into account the three major challenges that have been identified: industrial competitiveness through the application of enabling technologies (microelectronics, telecommunications, and new materials); the management of natural resources (environment, biotechnologies, and energy) and, finally, the achievement of maximum mobility, in particular for young European researchers.

In order to achieve these ambitious objectives, the Commission estimates that financial assistance of some ECU 7.7 billion will be necessary.

These are the main lines of the new framework programme in the field of research which the Commission is proposing to the Twelve on the initiative of Vice President Filippo Maria Pandolfi.

It should be noted that the Twelve's research ministers approved the proposal put forward by Mr Pandolfi on 20

June in Luxembourg and it is generally expected that the new framework programme will be adopted before the end of 1989.

Telematic Systems and the Large Internal Market

The telematics revolution which resulted from the combination of telecommunications and electronics, will have an even greater role to play in the run-up to the large market at the end of 1992. The framework programme for research will thus help to provide what might be called the "nervous system" of the single European market. New requirements have been identified which rely to an ever-increasing extent on advanced information technologies: the creation of a European administrative area, transport systems, health, distance learning for the working population, problems of rural society, and protection of the environment.

It will be necessary to develop high-performance telematic systems which require preparatory R&D work. As for information technologies proper, in addition to gearing the ESPRIT programme more towards the new generation of technologies by placing greater stress on prototypes, the framework programme 1990-1994 includes several new priority actions. In the key sector of microelectronics, for instance, one of the objectives is to contribute through R&D activity to the creation, inter alia, of a European manufacturing capability for new generations of "chips" in conjunction with the JESSI project under EUREKA. With regard to software, the objective is to develop systems and tools to improve the productivity of software made in Europe. From a more general point of view, the framework programme in the field of R&D will optimize the use of computer-aided design and manufacture in strategic industrial sectors.

In the field of communication technologies, the Commission is proposing not only to continue development of a modern integrated broadband network but also to develop new, profitable value-added services, adapted to ever-increasing user needs (mobile telephones, HDTV, etc).

Finally, in the field of enabling technologies, the framework programme 1990-1994 also includes a major action on industrial and material technologies. The objective is to contribute to the necessary rejuvenation of European manufacturing industry by developing its scientific base and making more use of advanced technologies. New priorities have been identified, such as, for example, the development of a "clean" car or the development of new products which will be virtually defect-free, and which will be stronger, recoverable, recyclable, etc.

The Challenges of the Environment, Health, and Biotechnology

With regard to the environment, R&D activities have a horizontal dimension, i.e., prenormative research aimed at introducing quality standards, safety norms, and methodologies to measure the environmental impact of a whole series of factors. These activities will, in particular, provide the basis for Community participation in the international "Global Change" programme.

In addition, the Commission is giving absolute priority to technologies and means of production which take into account environmental constraints. Our society, the Commission believes, is entering a crucial phase of conversion of technologies to production processes fundamentally different from those in the past in that they must be nonpolluting.

In the field of biotechnology, the objective is to strengthen the scientific base of the Community and to prepare for future Community regulations on various aspects of life sciences and technologies. Agricultural and agroindustrial research will be devoted in particular to increasing the resistance of plants, developing new biodegradable products, and providing clean energy sources by exploiting biomass. In the field of medical research, special emphasis will be placed on cancer research (early detection of carcinogenic factors) and AIDS, for which a new activity aimed at the development of AIDS control systems, including chemotherapy and vaccines, will be launched. In the developing countries, actions will be undertaken in the field of research into tropical agriculture and tropical diseases.

The main thrust of Community action in the energy sector will be shifted towards the development of clean and safe energy technologies. One aspect of research will also focus on energy utilization and look at environmental problems such as the greenhouse effect and acid rain.

With regard to the more traditional activities, Community action will seek to strengthen the prenormative dimension of nuclear fission safety and will continue the work on thermonuclear fusion, widening the field of research to include what is known as "cold fusion."

A Europe of Young Researchers

The Commission places new emphasis on "investment in human capital." The main objective is to enable young researchers at postdoctoral level to have acces to centres of excellence in other countries within the Community. Such mobility will apply not only to the natural and exact sciences but also to technologies and economic science.

The Role of the Joint Research Centre

The framework programme 1990-1994 also gives a new role to the Joint Research Centre. Its participation in the R&D strategy will involve the reinforcement of activities linked to the environment, industrial hazards, prenormative activity, research on nuclear safety, and a new emphasis on technology forecasting, which will enable the European scientific community to keep up-to-date with the new ideas and new requirements of European society.

Framework Programme of Community Activities in the Field of Research and Technological Development (1990-1994)

Breakdown of the Amount Deemed Necessary: (In millions of ECU)

I. Enabling Technologies

    1. Information and communications technologies—3,000

    2. Industrial and material technologies—1,200

II. Management of Natural Resources

    3. Environment—700

    4. Life sciences and technologies—1,000

    5. Energy—1,100

III. Management of Intellectual Resources

    6. Human capital and mobility—700

TOTAL—7,700

FRG: 1990 BMFT Budget Plan Presented

89MI0415 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 28 Jul 89 pp 2-5

[Text] Distinguishing features of the 1990 draft budget for the FRG Ministry for Research and Technology (BMFT) include a reduction in subsidies to industry, a primary concentration on basic research grants, long-term research policy programs, support for medium-sized companies, and research into solutions to urgent problems in fields such as medicine or environmental research. The government plans to allocate an overall total of DM7,855 billion to the BMFT, an increase of 5 percent over 1989.

According to Research Minister Riesenhuber, basic research has been the main beneficiary to date of the revision in research policy:

- Decisions since 1982 to acquire a new generation of major basic research facilities involving a BMFT investment of over DM3.5 billion. Examples include the research ship Meteor, the HERA [Electron-Proton Collider Ring] accelerator in Hamburg, and continental deep-drilling, the main part of which has now been financed;
- Following an above average increase in the funds for routine financing of the MPG [Max Planck Society] in the 1989 budget, a further increase of 3.3 percent is provided for in 1990;
- Fewer technology grants were awarded for projects undertaken by large companies, whereas subsidies for both medium-sized companies and applications-oriented basic research were increased. This is also evident in the increase in funds, from around DM310 million (1982) to DM615 million in 1988, that the BMFT has made available to the universities.

The number of preventive research programs was also increased. These include:

- Health research, which will have an additional 6.5 percent increase in 1990. The importance of this research area is obvious from topics such as AIDS, allergies, and the relationship between life-style and health risks;
- Environmental research and the development of environment-friendly technology has gained greatly in importance in recent years. The 1990 budget provides a total of some DM410 million for this area, including water and safety research;
- Funds for climate research, which have risen sixfold since 1982, are increased by an additional 8.8 percent. International agreements on the protection of the ozone layer are concrete steps, more of which must follow. Recent years have also demonstrated the urgent necessity of further international joint research;
- Research on improving working conditions will be funded jointly by the BMA (Ministry of Employment), BMBW (Ministry of Trade and Industry), and the BMFT working closely with industry and the unions. It will be carried out under a new program with new priorities, called "Technology and Work." The government draft of the 1990 BMFT budget allocates DM97.5 million for this purpose.

The total funds provided for preventive research have increased by over 73 percent between 1982 and 1990. During this period the share of the BMFT budget set aside for this area of research grew from 8.8 percent to 13.6 percent.

The BMFT budget has reduced technology grants to industry by DM1.3 billion since 1982. State funding focuses on the following tasks:

- Expansion of the research infrastructure in universities and research institutes;
- Technological development in the public sector, in areas such as reactor safety, traffic technology, and environmental engineering;
- Support for innovation and research in medium-sized companies.

Riesenhuber said that channelling funds back into industry and the vigorous initiative in research shown by the individual companies provided a chance to expand the research infrastructure in key technologies. Accordingly, research policy had exploited this chance in recent years, examples being:

- The establishment of successful genetic research centers;
- The expansion of the Fraunhofer Institutes, especially for information and manufacturing technology;
- The establishment of the Max Planck Institute for Polymer Research;

- The establishment of the German Institute for Artificial Intelligence (DFKI) in Kaiserslautern and Saarbruecken;
- Materials research centers.

Greater emphasis has been placed on funding applications-oriented basic research projects in key technologies. Joint projects bringing together research centers, companies, and university institutes have gained in importance accordingly. For instance, over 95 percent of the schemes in manufacturing technology are joint projects.

State subsidies for nuclear energy research continue to dwindle, with an additional 3.6 percent reduction in the 1990 budget. The federal government considers that state responsibilities currently lie in the following areas:

- Renewable energy sources, including rational exploitation of energy, where the FRG leads the world in state funding. Approximately DM280 million are provided in the 1990 budget;
- Fossil energy sources, after over 10 years of intensive funding of the various coal upgrading techniques (liquefaction, gasification), and low-pollution power station engineering, now focusing on fuel engineering, mining engineering, and power station design (e.g., multiple fuel power stations);
- Nuclear energy, focusing on safety research, waste disposal, and new reactor designs.

The federal government continues to regard nuclear energy as an important component of the national and worldwide energy supply. This view is confirmed by the threat of climatic changes resulting from CO_2 emissions due to the use of fossil fuels.

Support for medium-sized companies will continue and increase as a major element of research policy:

- New fields of technology will be included—such as microsystems engineering, which features for the first time in the 1990 budget (+25.7 percent);
- 1990 sees another above average increase in the Fraunhofer Society's allocation (+7.5 percent), to fund the establishment of additional demonstration centers serving medium-sized companies;
- As a follow-on to the successful TOU [technology-oriented companies] program, a new program was launched a few days ago to mobilize risk capital for the foundation of technology-oriented companies. It is expected to provide a total of DM399 million in investment capital between 1989 and 1994.

Funds for space research and engineering increase by DM175 million (13.6 percent) in the 1990 draft budget. Thus expenditure for space research accounts for 18.7 percent of the overall BMFT budget. This proportion is high, but still complies with a plan whereby expenditure on space research should not exceed 20 to 22 percent of the research budget. This strategy demands tight cost control; not every optional ESA [European Space Agency] program can be supported by the FRG.

The following graphs and tables give an overview of the 1990 BMFT draft budget.

List of Increases and Reductions in the 1990 BMFT Budget (Government Draft)—Compared to the 1989 budget (provided they exceed DM5 million and/or 5 percent)

Funding program	without GFE [basic research and development]				with GFE			
Reason for increase (listed according to program structure):	Target 1989	Target 1990	Increase/reduction		Target 1989	Target 1990	Increase/reduction	
			In millions of DM	Percentage			In millions of DM	Percentage
Routine funding for the Max Planck Society (MPG) (3.3% increase)	457.4	472.3	14.9	3.3	-	-	-	-

List of Increases and Reductions in the 1990 BMFT Budget (Government Draft)—Compared to the 1989 budget (provided they exceed DM5 million and/or 5 percent) (Continued)

Funding program	without GFE [basic research and development]				with GFE			
Special basic research programs, especially those at major research facilities (in particular, funding of the ESRF [European Synchrotron Radiation Facility], FRM/ BESSY II [Berlin Electron Storage Ring Society for Synchrotron Radiation], and Delta)	421.1	439.0	17.9	4.2	974.3	923.2	-51.1	-5.2
Geosciences (implementation of the continental deep-drilling program according to schedule; the need for additional funding is currently being considered)	48.0	55.0	7.0	14.6	52.5	59.3	6.8	12.9
Humanities, etc. (Phasing out the investment in the DHI [German Cultural Institute] in Paris	110.2	94.8	-15.4	-14.0	-	-	-	-
Marine research (particularly marine ecology and geology)	97.1	106.7	9.6	10.0	103.5	114.3	10.8	10.4
Polar research (intensification of North Polar research; GvN [expansion not provided] follow-up station	6.5	8.0	1.5	23.1	64.5	75.9	11.4	17.7

List of Increases and Reductions in the 1990 BMFT Budget (Government Draft)—Compared to the 1989 budget (provided they exceed DM5 million and/or 5 percent) (Continued)

Funding program	without GFE [basic research and development]				with GFE			
Space research and engineering (especially A, C, H)	1,137.5	1,303.6	166.1	14.6	1,290.8	1,466.7	175.9	13.6
Environmental and climatic research and engineering (national priority)	242.3	256.9	14.6	6.0	440.9	456.7	15.8	3.6
Health research (systematic implementation of the health research program)	152.1	164.9	12.8	8.4	327.3	348.5	21.2	6.5
Renewable energy resources, etc. (national priority)	249.9	255.0	6.0	2.4	272.3	276.7	4.4	1.6
Coal and other fossil energy sources	164.5	141.0	-23.5	-14.3	174.1	150.2	-23.9	-13.7
Nuclear energy research (THTR [thorium high temperature reactor] 300-RBV [expansion not provided])	380.7	348.7	-32.9	-8.4	707.9	682.7	-25.2	-3.6
Computer science (decrease to balance increased estimates in other areas)	104.0	93.0	-11.0	-10.6	214.8	210.9	-3.9	-1.9
Electronic components (JESSI [Joint European Submicron Silicon Initiative])	186.2	187.0	0.8	0.4	239.0	244.8	5.8	2.4
Microperipherals, etc. (small and medium-sized company measures)	74.8	94.0	19.2	25.7	-	-	-	-

List of Increases and Reductions in the 1990 BMFT Budget (Government Draft)—Compared to the 1989 budget (provided they exceed DM5 million and/or 5 percent) (Continued)

Funding program	without GFE [basic research and development]				with GFE			
Manufacturing engineering (decrease to balance increased estimates in other areas)	115.0	107.9	-8.0	-7.0	115.6	107.6	-8.0	-6.9
Physical and chemical technologies (Superconductors)	129.5	156.7	27.2	21.0	217.2	251.6	34.4	15.8
Traffic research (decrease to balance increased estimates in other areas)	182.0	174.0	-8.0	-4.4	183.5	175.5	-8.0	-4.3
Geosciences (especially deep drilling)	48.0	61.0	13.0	27.1	52.5	65.3	12.8	24.4
Routine funding for the Fraunhofer Society (FhG) (according to schedule; new small and medium-sized company activities)	153.1	164.5	11.4	7.5	-	-	-	-
R&D growth program (drop in the number of applications for this program, which is to be discontinued)	55.0	60.0	5.0	9.1	-	-	-	-
Technology transfer (phasing-out of contract research, restructuring of activities under the technology transfer heading)	83.0	60.0	-23.0	-27.7	-	-	-	-

Profile - Funding program	Target 1990 (millions of DM)	Proportion in 1990 Draft - Percentage	Increase 1989-90 - Percentage	1989 Expenditure (millions of DM)
Total of 30	7,855.2	100.0	5.0	7,478.6
1. Interprogram basic research	1,555.7	19.8	-2.4	1,594.4
Routine funding of MPG [Max Planck Society]	472.3	6.0	3.3	457.4
Special basic research programs	923.2	11.8	-5.2	974.3
Geosciences (especially deep drilling)	65.3	0.8	24.4	52.5
Humanities, social sciences	94.8	1.2	-14.0	110.2
2. Long-term state programs	1,852.9	23.6	11.9	1,655.1
Marine research	114.3	1.5	10.4	103.5
Polar research	75.9	1.0	17.7	64.5
Space research and space engineering	1,466.7	18.7	13.6	1,290.8
Nuclear fusion research	196.0	2.5	-0.2	196.4
3. Preventive research	1,066.3	13.6	5.3	1,012.6
Ecological research	210.5	2.7	2.6	205.1
Environment-friendly and environmental protection technologies	169.6	2.2	3.6	163.7
Water research	21.3	0.3	4.5	20.3
Climate research	45.3	0.6	8.8	41.7
Safety research and safety engineering	10.0	0.1	0.0	10.0
R&D on health matters	348.4	4.4	6.5	327.3
R&D to improve working conditions	97.5	1.2	2.6	95.0
Building research and engineering	40.0	0.5	-0.7	40.3
Interdisciplinary activities including assessment of the consequences of technology)	123.6	1.6	13.3	109.1
4. Market-oriented technology funding	3,076.7	39.2	0.2	3,071.0
Marine engineering	64.7	0.8	4.3	62.1
Coal and other fossil energy sources	150.2	1.9	-13.7	174.1
Renewable energy sources and rational energy exploitation	276.7	3.5	1.6	272.3
Nuclear energy research (including reactor safety)	682.7	8.7	-3.6	707.9
Computer science	210.9	2.7	-1.9	214.8
Electronic components	380.5	4.8	1.4	375.1
Application of microelectronics; microperipherals	94.0	1.2	25.7	74.8
Manufacturing engineering	107.6	1.4	-6.9	115.6
Biotechnology	231.9	3.0	1.7	227.9

Profile - Funding program	Target 1990 (millions of DM)	Proportion in 1990 Draft - Percentage	Increase 1989-90 - Percentage	1989 Expenditure (millions of DM)
Materials research	217.1	2.8	0.7	215.6
Physical and chemical technologies	251.6	3.2	15.8	217.2
Aviation research and hypersonic technology	210.1	2.7	1.5	207.0
Research and technology for surface transport and traffic	175.5	2.2	-4.3	183.5
Safeguarding of resources	23.3	0.3	0.6	23.1
5. General conditions, infrastructure	427.4	5.4	-2.6	438.7
Routine funding of the Fraunhofer Society	164.5	2.1	7.5	153.1
Innovation and improved general conditions	166.5	2.1	-11.4	188.0
Specialized information	96.4	1.2	-1.2	97.6
Overall reduction in expenditure	-190.0	-2.4	0.0	-190.0
Not yet allocated to specific headings	0.0	0.0	-	-166.8
Federal Ministry for Research and Technology (BMFT)	66.2	0.8	4.0	63.6

FRG-USSR Sign S&T, Space Accords

*36980256c Paris AFP SCIENCES in French
22 Jun 89 pp 13-14*

[Article: "FRG-USSR: Signature of Eleven Accords and Agreements"]

[Text] Eleven accords and agreements on cooperation between the USSR and the FRG were signed on 13 June in Bonn, on the occasion of the visit of Mikhail Gorbachev. Two of those accords concern scientific research and space. The first, signed between the governments, provides for a broadening of cooperation in the areas of research and higher education. This cooperation has already been in existence for approximately 20 years, but it has been given new impetus by *perestroika* and *glasnost.*

According to Mr Cyrille Diumayev, vice president of the Soviet State Committee for Science and Technology [GKNT], co-president of the German-Soviet Commission on Scientific and Technical Cooperation, joint research programs were defined in the following areas:

- Nuclear energy: specifically, problems related to increased security of power plants and nuclear fusion. - Study of the basic characteristics of matter. Superconductivity at high termperatures. - Medicine and molecular biology. - Plant genetics. - Animal genetics. - Computer science and data systems. - High definition television.

The second agreement provides for a new development of bilateral cooperation in the exploration and use of space for peaceful purposes. The two parties expressed support for a rapid implementation of the ad hoc agreement between the Academy of Sciences in Moscow and the German Federal Ministry for Research and Technology, dated 25 October 1988, and of the first cooperation program, including participation by a German cosmonaut scientist in a flight to the Soviet orbital station. The competent bodies of both parties have been empowered to conclude an agreement as soon as possible on the organization of this flight.

On the other hand, the development of a whole program of cooperation in the area of space research is in the process of being completed, providing for joint activities in the study of the relationship Sun-Earth, the solar system, the planets and comets, etcetera. According to Mr Diumayev, one of the vital links of this space cooperation between the two countries will be "the participation of the FRG in the financing, the construction and the launching of carrier rockets and other elements of space technology."

The other accords or agreements concern:

- Exchanges of students, school children and teaching personnel. Numerous scholarships will be granted by the Germans (Conrad Adenauer Foundation, Friedrich Eberth Foundation, etcetera) for stays by scientists, upper level students, and Soviet teachers in the FRG. They are specifically expected to undergo training in German enterprises. Fifty Soviets will take courses in management schools and 100 scientists will take summer courses in German. - The creation of cultural centers in both countries. - Mutual assistance in the case of natural

disasters. - Additional exchanges of memoranda on rapid notification in case of a nuclear accident and on the exchange of information concerning nuclear installations. - The creation of study groups to delve deeper into judicial questions relative to the fight against international terrorism, drug addiction, the law of the sea, the Arctic and Antarctica, etcetera.

Finally, the creation of a study group in the area of ecology has also been proposed.

France: R&D Modernization Plan Discussed

36980256d Paris LE MONDE in French 1 Jul 89 p 12

[Article by Jean-Paul Dufour: "The CNRS Wants To Provide New Impetus to Its Laboratories— Modernization, Interdisciplinarity and Career Improvement"]

[Text] On Tuesday, 27 June, one year after his appointment to the general management of the CNRS [National Center for Scientific Research], Mr Francois Kourilsky explained the program he intends to implement to modernize that body, make its management more flexible, strengthen the competitiveness of its laboratories and strengthen its cooperation with foreign research centers.

"In the still recent past, some people wanted to fragment the CNRS, to transform it into an agency subsidized by a university which was in crisis at the time. That proposal has been abandoned," stated Mr Kourilsky. With 1,300 laboratories which employ 50,000 individuals (25,700 of whom are salaried), and a budget of more than 9 billion francs, the CNRS, which this year celebrates its fiftieth anniversary, is the most important research body in Europe. It is also unique in its principle: a "French model" which resolutely dissociates itself from the others with, its manager admitted, "the weak points of its strong points," specifically "a certain bureaucracy."

The draft decree provides for the establishment of a "directorate for strategy and programs in charge of coordinating and overseeing the permanent process of development of the scientific policy of the CNRS." Its first order of business will be to develop a strategic, revisable, plan over 3 years, the first outline of which will be published in February 1990. It will take into account "the demands society makes onscience," and will make a large space for interdisciplinary research (environment, new materials, the science of communication and knowledge, for example). In order to further this interdisciplinarity, the lines between the various departments within the CNRS and the divisions of the commissions of the national committee in charge of evaluating the work of the laboratories and the scientists will be reviewed and made more flexible.

Like his predecessors, Mr Kourilsky stresses his intention to "provide all the CNRS laboratories with the resources to ensure high quality production, competitive at the international level." An effort has already been made this year in some areas such as the science of man and of society, the physics and mathematics laboratories where the situation was particularly alarming, he stated.

This financial readjustment will remain a priority in the years to come, but it will be accompanied by greater stringency. Thus, the establishment of new laboratories will be "strictly dependent on budgetary possibilities." Between 1986 and 1988, the CNRS withdrew from more than 120 research units. "Our choice here will inescapably lead to an increase in this tendency," indicated Mr Kourilsky. In order to help this effort, the general manager of the CNRS has expressed the desire that "some pause" be observed in the creation of very large equipment (particle accelerators, telescopes, etcetera) which currently absorb 560 million francs from the budget.

To mobilize and further the creativity of 26,000 salaried employees in an institution such as the CNRS would seem to be a challenge. In order to be successful, Mr Kourilsky relies on dialogue and the "systematic gathering of information." Thus, an audit of 4,500 officials is in progress. Already, the budget allocated to permanent training will be tripled, and an elaborate training plan based on a survey of 15,000 salaried personnel will be published within a few weeks. Another measure which was announced: the putting into place next September of a "human resources delegation." All of this is accompanied by "reflection on the improvement of careers, promotions and recruitment levels, currently under way between the Ministry of Research and the unions." A significant step when it is known that the CNRS recruits young scientists at a base salary of... 8,500 francs gross per month!

Will all of this be sufficient to finally mobilize the personnel? Mr Kourilsky, who would like to go further, mentioned "the obstacles represented today by certain regulations of the civil service" (which the CNRS is part of) "and of the budget." "In some regards, the CNRS would probably gain from being run as an enterprise, but the diagrams of an enterprise cannot be tacked onto a body like ours," he said regretfully.

While waiting for a possible major change, a "significant adaptation of the central administration" is in progress. It is based on an analysis conducted by the "studies and audit service" which the CNRS has acquired recently. This recovery will be translated specifically into increased regional "deconcentration," with the current "administrative services" being transformed into "regional services" led by a single official. The division of the regional and inter-regional districts will be reviewed, and three new services will be established by 1991.

Increased Cooperation with Industry

This search for efficiency and competitiveness finally passes through increased cooperation with the outside. Mr Kourilsky wants to triple the flow of exchanges of researchers between higher education and the CNRS

where an administration specifically in charge of university relations has been established. Collaboration with industry has not ceased to develop over the last 7 years. In 1988, the CNRS, which works with 2,000 industrial partners, registered 200 patents in conjunction with them, and 91 in its own name. International relations are also intense: 55 official agreements signed with 40 countries, 3,500 actions of international cooperation were itemized. The CNRS laboratories currently shelter 3,000 interns from all over the world, and 680 foreign researchers are among its manpower. Henceforth, the objective is to develop cooperation with other European research bodies and laboratories, to stimulate ties among researchers. The very size of the CNRS gives it a significant role in this area: of the 88 European scientific networks financed in 1989, 58 are coordinated by one of its researchers. In addition, it has established around its Brussels office a body baptized Club of Research Bodies and Comparable Activities [CORA], a sort of lobby aimed at ensuring a more effective presence with the European institutions, and which groups several French establishments on a collegial basis, including INSERM, INRA, the AEC and INFREMER.

Threatened with dismantling in 1985, then deprived of recruitment for more than a year, the CNRS, barely convalescent, committed itself completely to "modernization." A "permanent, evolutionary process, a lengthy step," stressed its general manager. Nearly a state of mind, different in principle from the multiple reforms decided from above which, until now, had periodically shaken this sickly pachyderm. As a matter of fact, it is stressed at the Ministry of Research that the reform project in progress is only a "grooming of the organization decree," aimed at most at furthering Mr Kourilsky's modernization plan. Could the CNRS finally have found its second wind?

SUPERCONDUCTIVITY

FRG Superconductivity Funding Outlined

89AN0293 Paris LE MARCHE DE L'INNOVATION in French 23 Jun 89 p 3

[Text] The FRG Ministry of Research and Technology (BMFT) considers low- and high-temperature superconducting materials one of the key technologies of the 1990s. Between 1989 and 1995, R&D investments in this sector are expected to reach DM 1.2 billion (including DM 400 million from the BMFT). Next year, overall high-temperature superconductor (liquid nitrogen) R&D expenses will amount to DM 100 million, with DM 35 million coming from the BMFT, DM 21 million from research centers, DM 20 million from universities, and some DM 30 million directly from industry.

TECHNOLOGY TRANSFER

FRG, USSR To Set Up Clean Room Venture

89AN0331 Brussels EUROPE in English 15 Sep 89 p 17

[Text] The German company Deutsche Babcock is strengthening its interests in the Soviet Union through the establishment of a joint venture whose activities concern sterile-room techniques. Located in the Caucasus, it will start operations in late 1990; employing from 60 to 80 people, it will manufacture products for the computer industry. The German company Babcock BSH AG (Bad Hersfeld) will hold a 24 percent stake, with the remaining 74 percent [figures as published] being held by the Soviet company Technopribor. Deutsche Babcock opened a representative office in Moscow in 1979. Its average yearly turnover with the Soviet Union amounts to some DM 80 million.

COMPUTERS

GDR's Software Development Strategies Examined

23020087 East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German No 8, Aug 89 pp 7-10

[Article by Dr Mathias Weber: "Formulating a Strategy in the Software Industry"]

[Text] The development of a strategy in the borderline area between computer-integrated manufacturing (CIM) and the new branch of the industry concerned with software production requires a description of the points of reference to be considered against an international, economic and technical background. With this goal in mind, we will first look at the relationship between software technology and other flexible production technologies as a new method of production. The experience gained in formulating a strategy is evaluated in determining the directions in which further efforts should proceed.

This discussion concludes with a summary of the basic directions which the leadership and planning system should take with respect to this new branch of industry dealing with software production.

New Methods of Production and Strategy Formulation

The objective in formulating a strategy is the creation of bundles of innovations—*technological systems.* The step-by-step transition from one technological system to the next one opens up new potential which usually can only be effectively fully utilized after social and economic boundary conditions have been changed. Technological systems form the basis for a series of industrial production methods. Flexible production is defined primarily by microprocessor technology, electronics as a whole, computer technology, the construction of electronic equipment and communications technology.

The diversity and increasingly complex nature of modern automated systems make it more and more evident that the effectiveness of such systems depends on the degree to which human experience and knowledge gained in the production process have played a part in system development. Information and knowledge technology, and in particular software technology, therefore help form the basis of the new production method.

Through the increase in the degree of automation, flexibility and integration of flexible automation systems, software is increasingly becoming one of the factors which determine the effectiveness of computer-aided manufacturing processes. At the present time, the production of software is one of the factors which limits both the quality and quantity of automated systems. The number of different kinds of CIM software are reflected in the width of the spectrum of required software technologies and levels of automation in software production.

Experience gained internationally since the 1970s emphasizes that conflicting strategies in the production of software can be eliminated only on the basis of a set of long-term, scientifically well-founded measures. Software strategies are required on a number of different performance levels.

In information systems (IS), the wealth of experience gained by highly-industrialized countries is available in the form of software, data, algorithm, method and knowledge banks. Knowledge is accumulated information, and includes the knowledge of relationships, hypotheses, laws, rules, etc.; it is the result of intellectual work, and can be increased as well as regenerated. The information and knowledge industry primarily supplies information- and intelligence-intensive products and services which can take on the character of goods, including also software development and sales.

The amount of potentially available knowledge depends on the extent to which it has been possible to separate such knowledge accumulated on an individual basis from the person(s) who have accumulated it. An increasing number of basic economic units are becoming specialized in the technology of formalizing professional knowledge; they form a currently highly dynamic sector in the knowledge industry. Using traditional knowledge technologies, automation had access to only a small part of the overall societal knowledge base. Important tasks to be carried out at present in the development of computer-integrated manufacturing are as follows:

—the further "socializing" of knowledge, the creation of scientific, technical and societal prerequisites which will allow the most powerful, deeper levels of human knowledge and intellect to be included in the formulation of production methods, and

—the adaptation of automation technology to human potential and requirements wherein comprehensive potential is seen in systems which use artificial intelligence.

International Developments and Requirements of Strategy Formulation

Requirements in the GDR can also be derived from significant trends in international markets for software and intelligence-intensive products and services. The leading vendors of information systems on the world market believe that several indications of saturation and a decline in prices in the hardware production sector can be offset by a stronger presence in software and in the area of services for information systems (the market sectors with the strongest growth rates). A position among the leading monopolies in the software and IS services market can be claimed only by basic economic units which have available to them software strategies oriented toward innovation, and aggressively exercise

such strategies in the marketplace. To do this, large investments must be made in research and development each year in the field of software technology. In industrially advanced countries, a wide variety of organizational forms have appeared among companies specialized in software and IS services (a reflection of the functional and technical variety of software processes and products). Companies which offer software and IS services represent the vanguard of the emerging knowledge industry. American software companies enjoy a leading position, not least of all due to the advanced level of their software engineering research and the knowledge-intensive nature of American industry in general. Penetrating the closed ranks of powerful American companies is a difficult proposition. Mass markets for software products are already largely monopolized. As has been shown by an analysis of a number of software strategies in capitalist countries, the creation of a flexible and effective system of interrelationships among innovative companies has become the most important task of high-technology strategy formulation.

The Information and Knowledge Industry: Requirements for its Creation in the GDR

The step-by-step transition to flexible production, initially involving a small number of GDR enterprises and later whole industrial sectors, must bring with it a change in the relationship between basic economic units: Basic economic units are turning more and more to *direct* economic relationships with their cooperative partners and customers. This, in turn, leads to a change in leadership content, its methods and organization. Information flows horizontally rather than vertically, and network structures are superposed on hierarchical ones. These changes will bring with them a change in increasingly significant central state leadership and planning, which will make increasing use of economic leadership methods and will be able to more strongly dedicate itself to strategic and pan-industrial questions of economic leadership.

The increase in the independence and responsibility of individual enterprises in the leadership and planning of all phases of the economic reproduction process as well as in the use of proceeds expands the requirements for effectiveness of the law of value. "There is increasing demand for prices to be established in accordance with the amount of social work expended and the equivalent exchange, i.e. demand for effective use of the productivity-enhancing effect of the law of value in the interior of the country as well."

It is precisely here that one can find the essence of the economic mechanism which unifies the socialist market, "a network of compatible relationships between equal partners which is controlled by society using a system of economic and legal measures," with the levers of central state planning.

"... an essential characteristic of the increasing development of leadership, planning and economic accountancy (is) the creation of favorable conditions for the producers of goods ... so that they can meet their responsibility with respect to the national economy." In this way, the preconditions are created within the economy itself for the supplementation of initial planning directives by other planning forms.

Scope of GDR Software Production and Software Exports

Software statistics have been kept in the GDR since 1986 by the State Central Administration for Statistics (SZS). According to these statistics, software production in 1988 grew by more than 30 percent over 1987. In interpreting these figures, it must be kept in mind that the number of software production enterprises whose statistics were recorded more than doubled between 1987 and 1988. In order to eliminate this *recording effect*, a separate analysis was conducted with respect to those enterprises which are involved in the large-scale development of software for flexible automation. This analysis indicated that roughly two thirds of (overall) growth in software production was accounted for by enterprises whose software statistics were recorded in both 1987 and 1988.

For basic economic units, ministries and economic sectors, available statistics allow analyses of (overall) software production, receipts from software sales to third parties (*market share*), own-use software development, the size of the labor force involved in software production (overall) and production for sale to third parties, and analyses of costs and labor productivity; these statistics therefore are an important base on which to formulate a strategy for the software industry. A few of the leading nations in the field of software technology account for roughly 20 percent of software sales outside the GDR. An analysis of GDR software exports (contracts exclusively for software exports as well as contracts for the export of software in conjunction with other services), the focus of which was a breakdown of all contracts according to ministry and combine for the individual country groups, showed that there is still much room for software export growth.

A comprehensive analysis of software production for the area of flexible automation as a whole is not yet available. At the present time, the available data (semiannual figures for flexible production systems) do not permit a statistical analysis of the interrelationships among parameters such as degree of automation, technical configuration, economic results, one-time investment and software used. Considerable discrepancies are evident between the figures given in international literature for the software percentage of overall investment costs for flexible production systems and other systems for the *Fabrik 2000* (roughly 20 to 40 percent, with an increase in this figure projected for the 1990s) and the figures determined for several flexible production systems in the GDR. The cause of these discrepancies most likely lies in the differing hardware prices, and also in the as yet inadequate business aspects of software production.

Software Technology in the GDR

A comparison of a selected group of statistics (such as software exports and percentage of the total social product or gross national product represented by software) shows that great efforts are needed in the GDR to accelerate the growth and development of a software (and knowledge) industry. Modern methods of software technology have to date made only a modest entry into industrial practice. The causes of bottlenecks in the availability of software are many and varied:

—Qualification

Although software potential has indeed been greatly expanded in the past several years, the theoretical and practical background on a technological level, in most cases, has had to be acquired on a catch-up basis by the additional employees in the industry.

—Research Capacity

Preliminary scientific research in the field of software technology, as well as the numbers of persons involved, are not sufficient to allow the production of modern software development systems in the GDR. The consequences of less-than-adequate domestic research have been investigated in other socialist countries (Makarov criticized the fact that the USSR is still a "consumer" of the US software industry. "As a result of orientation toward foreign programs, a large number of collectives are only capable of adapting these programs." And as a final result, the level and relative significance of domestic software innovations are reduced.

—Current Status of the GDR Software Industry

In comparison to the leading countries in the field of software production, the number of enterprises producing software in the GDR is still small, and ways are seen to improve upon the structure of operating variables, as software enterprises offer a number of advantages over other organizational forms (e.g. effective use and adequate motivation of available highly-skilled software specialists, economic justification of large investments in integrated software development environments, high value of the software economy, generation and cultivation of specific CIM software know-how).

—Cooperation Among CEMA Nations, and Between Industry and Information-Gathering Facilities

According to, cooperation among CEMA nations does not reflect the internationally advanced state of the art. Cooperation among research institutions and industrial partners, including the formation of production strategy, is not an easy task due to the required short-term reorientation of the majority of the basic economic units. The cause lies in an inconsistent long-term perspective in some quarters, and leadership and planning functions which are too highly centralized.

—Strengthening of Economic Management Methods

At the management level of the software industry in the GDR, a significant role is played by administrative methods (balancing as a form of social coordination of development work in order to place software development projects within a strategy framework, function and method of operation of subject-oriented information and consulting facilities (SIBE), and pricing). There is not much economic interest in making high-quality software information available. During changeover to consistent economic accounting, existing SIBEs, project or program banks, which must be considered as a significant first step, can contribute considerably more effectively to an expression of the multi-faceted characteristics of software, the division of labor, and cooperation in the development of software, and thus promote the use of non-patented software developments as the most effective way, in principle, to produce software.

An analysis of the current situation emphasizes that advances in software technology and in the software industry, which are necessary in order to provide leadership in advanced technologies, require establishment of a coordinated plan of action for research institutions and industry, state leadership and planning organs, creation and qualification with effective socioeconomic mechanisms for communication and for the unified channeling of efforts in the right direction.

Formulation of Strategy in Software Production: Current Status and Past Experience

The creation of a framework for the establishment of a software infrastructure and the development of software strategies began in the mid-1980s as the result of central decisions. In the meantime, an economic software concept has been prepared, and agreed upon between the Robotron combine and data processing—a result of significant proportions. The current status of strategy development can be described as follows:

1. Initial steps in the formulation of a strategy are being taken. This development work centers around substantive basic directions (CAD/CAM/CIM, software technology, database administration systems and artificial intelligence, among others). The colloquium *Software Strategies for Flexible Automation* (held from 10-14 April 1989 in Mirow) showed that the linkage of a software strategy to computer-aided business management—and further with economic, technical and social processes in their entirety—is proper. Further strategic research nevertheless must ensure complete quantitative penetration of the established principal directions as well as the preparation of alternative scenarios. The time frame established for the formulation of an economic software strategy must be further extended.

2. Complex problems must be solved for the qualification of the statistical basis on which the strategy is to be formulated. Further preliminary theoretical work is required to evaluate software processes and products.

3. Software strategy formulation will in the future be more closely tied to strategic programs for other advanced technologies, and can be qualified via the provision of economic orientation parameters (for the long term). Great significance is assigned to the development of information engineering in specific fields and the theoretical penetration of comprehensive areas of IS application in the forefront of software production.

4. Ways are seen to improve upon software strategy formulation leadership (guaranteed independence from the reproduction requirements of individual combines, motivation of the workforce and the incorporation of this research work into the planning mechanism, wider-ranging public discussion within the scientific community, etc.).

5. Too little attention has been given to the non-compromising comparison of domestic production with the level to be expected world-wide by 1995.

6. It must be stated that the complexity of previously submitted strategies is still insufficient in light of an analysis of software technology programs being pursued world-wide. In particular, concepts for the establishment of production conditions which adequately meet the requirements of the specific and dynamic nature of the production effort are lacking.

Overall it has become clear that interdisciplinary and methodological efforts in formulating a strategy must be intensified. The theoretical groundwork is thus far inadequate, in particular in the fields of software economy and the economy of intellectual production. Software development concepts which now exist can be classified in terms of efforts to establish the primary directions to be followed by scientific and technical advances into the next millennium.

The Software Industry and Strategy Formulation: Development Potential

The leadership and planning of the development of technological systems (and methods of operation) extends far beyond the limits of individual branches of industry. Due to the social significance of software production, it does not seem prudent to manage software production efforts centrally or via a technical ministry. At the above-mentioned colloquium, the opinion was expressed that a central leadership function could be realized through formation of a "state secretariat for information engineering" which, in addition to managing and advising software production facilities which are to be concentrated, would take on the task of continually working toward the economic formulation of strategies and their expression in concrete terms for selected areas of emphasis, and would also promote the development and broad application of advanced software technologies.

The improved cooperation between industrial enterprises and scientific facilities, based on mutual long-term economic interests, has become one of the most important tasks in the social utilization of key technologies. There are plenty of suggestions as to how to continue to develop mutually beneficial relationships between the industrial and scientific communities.

Two central theoretical problems in the Political Economy, the dialectic of plan and market and the improvement of socialist ownership relations, are of great relevance in the development of the information and knowledge industry in the GDR. Recent research indicates possible fundamental directions to be pursued in improving the economic mechanism in this industry; such directions include the expansion of the sphere of influence of relationships between goods and money on the production of information and knowledge.

Haustein has stated that the economic use of software, its value in terms of real, monetary equivalents which balance each other, freed from the confines of capitalism, expresses the need for the development of productive efforts, and he called for detailed empirical research into the use of software in order to discern ways in which this goods and money environment can be used to benefit socialist society.

At present, ways are being sought to intensify the stimulating function of the market for software with the objective of promoting an economically effective distribution of labor, cooperation among the producers of software, and industrial software production. The market for software, understood as a direct connection between software developer and user which does not rely on an intermediary, needs reassurances of viability in the form of independent software production and service enterprises which supply information and provide consulting services, an adequate pricing system, socialist competition in order to satisfy the needs of society, user groups, quality standards and legal regulations. In summary, our objective must be to strive for a more consistent relationship among software developers, intermediary service enterprises, operators and users of software within an economic framework.

In many industrialized nations, innovations in development have led to the formation of a very diversified division of labor in which specialized companies realize an important function in the introduction of production. It is precisely in assuring the dynamic nature of the information and knowledge industry that small and temporary structures play a key role.

Social scientists are interested in organizational forms which all pursue one goal: the greatest possible stimulation of creativity, pioneering spirit and initiative, an increase in independence and responsibility, and creation of an atmosphere which promotes competition and the search for solutions. The establishment of a system of leadership and planning for the information and knowledge industry must be supported through a variety of interdisciplinary research activities.

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Flexible Automation Systems Displayed at Leipzig

23020086 East Berlin MIKROPROZESSORTECHNIK in German No 7, Jul 89 pp 221-224

[Article by H. Hemke, H.-J. Hill, and H. Weiss: "Flexible Automation:'89 Fair Theme"]

[Excerpts] Integration of microelectronic components and devices into systems for manufacture of tools and processing machines is acknowledged worldwide as the recipe for success for increased productivity and product quality. It is the prerequisite for conversion from individual machines to flexible automation machine systems. The theme of both 1989 Leipzig fairs establishes the objective of presenting this close interconnection of microelectronics and machine manufacture in the exhibit program of domestic and foreign exhibitors as well as in scientific and technical organizations and of demonstrating future-oriented solutions. Especially in the metal processing industry, but in other fields as well, flexible production automation is currently the most progressive manufacturing concept. With this theme, the Leipzig fair continues its time-tested practice of placing internationally current economic developments in the focus of fair activities. For the spring fair [LFM], the great demand from abroad for exhibition space, especially for the machine tool and tool sectors, as well as the numerous registrations for specialized lectures related to the theme underscored the lively interest in this theme. The effect of information technology on production is reflected not only in its integration into machine manufacture—demonstrated for example in exhibit hall 20—but also in virtually all areas of production.

In the first part of our report on the LFM we concentrate primarily on the area of computer-aided design where it no longer seems practical to make a strict separation of software and hardware. We then turn to that computer technology which cannot be classified as CAD/CAM-specific: personal computers, for example.

In the continuation of the report on the fair in MIKROPROZESSORTECHNIK No. 8/89, we will tell you about peripheral hardware, modular units, and additional software offerings.

CAD/CAM/CAP

The Automation Plant Construction Combine's top-of-the-line product for flexible automation was the industrial computer ICA 700 (industrial computer automation). For the first time the terminal model of the ICA 700 was introduced as the lead computer for a cell of flexible automation systems for turned parts and case parts with a tall shelf-type bin and with assembly robots. The range of applications of this family of computers extends from programming under DCP and use for data acquisition and processing, control and oversight of groups of units, sections of plants, and production lines as well as for laboratory automation all the way to startup and servicing of automation devices and systems. This universality is achieved through a two computer

design (PC and realtime computer) and a modular component structure of the realtime computer section as well as through a family of devices. This family of devices consists of the modular, user-configurable model ICA 710.10, the cabinet model ICA 710.20, and the terminal model ICA 710.30. The devices of the ICA 710 series use the 8086-compatible processor K1810WM86, and their PC component is PC/XT compatible. However, the PC component of the future ICA 720 series will be PC/AT compatible and will be expanded by the portable model ICA 720.40.

Using the ICA 710.20 as an example, a few major features are mentioned: The cabinet model industrial computer designed primarily for use under harsh conditions consists of a main computer (PC component) and a process link (realtime computer system). The two computer components are linked via an internal ICA interface. The PC component includes a 20- to 40-MByte hard disk, two 720-K floppy drives, 256-K RAM (expandable to 640 K), 32-K ROM, and the 4.915-MHz K1810WM86 (K1810WM87 as an option). The operating system may be either DCP or the UNIX-compatible MUTOS. The realtime computer component has a system bus and a resident bus. The multimaster-capable system bus is compatible with the multibus, the AMS bus, and the system bus of the MMS 16 (16 master maximum). The resident bus is identical to the system bus except it lacks multimaster capability; with it, all operations run without conflict and at maximum speed. The realtime computer component includes a central unit with K1810MW86 and K1810MW87, battery-supported SRAM in addition to DRAM's and EPROM's, interfaces (IFSS, IFSP, Centronics, V.24, IFLS), and the Ethernet-compatible ROLANET 1 as an option. Six distinct digital and two distinct analog units are available for process input and output; a maximum of 22 process I/O components is possible. BOS K1810 and EMOS 2 may be used as operating systems.

Minispot is one model of the SPOT 83 process computer system from the Romanian company ICE-Felix-Werken. The system is distinguished by its variability relative to both the CPU—a single board computer—and the process-specific module. Whereas, for example, the CP 04 version has the 8080 8-bit processor and the CP 05 version has the Z 80 8-bit processor, the CP 06 model with the 8086 16-bit processor was introduced in Leipzig. Furthermore, the board contains a maximum of 128-K RAM and 32-, 64-, or 128-K ROM. Four RS 232C's or, as an option, the 20-mA current loop may be used as interfaces. Thus, it is possible to use the Minispot computer as a stand-alone system, a local system, or a remote system—for example, linked to the Romanian CORAL or Independent I102F/I106 minicomputers, which use PDP-11-compatible software.

This year's Bulgarian exhibit was not so much in the category of hardware as—in keeping with the theme of the fair—in the category of production organization. Therefore, although components and memory technology were certainly included, the emphasis was on networking capabilities of the computers and on CAD/CAM software solutions. Examples include a program system for design and technical preparation for production on the EC 8531.M2 terminal and a technical programming complex for automation of discrete and discontinuous processes named PROCON.

A prerequisite for efficient automation of the production process is the rapid, reliable, and cost-effective development of electronic controls. Consequently, in the next few years the share of application-specific integrated circuits (ASIC's), capable of replacing entire circuit boards, will increase by leaps and bounds. Efficient design systems must be made available for this. Thus, CAD systems are the prerequisite for the development of additional new CAD/CAM systems.

A major representative of the ASIC's is the gate-array IC. The VEB Microelectronics Research Center Dresden offered the programming system ARCHIMEDES for the design of the gate-array system U 5200/5300. With it, efficient circuit designing with short developmental times and a high degree of design reliability is possible interactively making full use of the system. Continuous status data about the current processing status and programming aids as well as numerous properly sequenced test steps are also included in this CAD system.

Input of body lines in a special network descriptor language is a requirement for all additional steps, from preprocessing of text and generation of a network code to static logic simulation, positioning, roughing-in of lines, and dynamic logic simulation all the way to automatic generation of test protocols.

An integrated library of macros contains and documents predeveloped basic circuit elements (physical macros) and their logical, electrical, dynamic, and topological descriptions. Additionally, complex circuits composed of circuit elements such as counters, write registers, or arithmetic units are offered as so-called software macros, with positioning of the individual gates occurring only at the time of the positioning of the entire circuit. ARCHIMEDES runs on 32-bit platforms (e.g., K1840).

The IGT K8919.11 was presented as a new interactive graphic terminal for the Robotron Combine's 32-bit computer series. It includes a graphic processor which manages image storage with 8 storage levels of 1280 x 1024 bits (pixels) each. A serial interface (IFSS/V.24) and a DMA-capable parallel interface are available for connection to a host computer (here the K1840). Serial data transfer rates from 50 to 19,200 baud may be selected. For on-screen display, the terminal has four color systems capable of producing as many as 16 million colors as well as the capability of converting the colors into 256 shades of gray.

Several program systems were demonstrated on the K8919.11, among them the UMSCHA system and the TEXgraf graphic editor.

The UMSCHA program system was developed by the Dresden Technical University to permit evaluation of stresses and deformations such as those occurring with the shaping of doubly curved surfaces in automobile manufacture and shipbuilding and in the shoe and clothing industry. It is also a geology tool. Force and work expenditures at any level of the shaping processes can be determined for elastic, rigid-plastic, and elastic-plastic material behavior. In interactive calculation, shaping processes including consideration of variations in wall thickness and elastic resilience are quickly measured and geometrically edited, with the results displayed graphically. The hardware requirements for the UMSCHA system in FORTRAN are K1840/IGT-2 (K8919) and the SVP 1800 operating system.

The graphic circuit editor TEXgraf from VEB Textimaelektronik is an important tool for the developmental engineer as a component of gate-array design systems. In the age of ASIC's, user-friendly CAD systems assume increasing significance. TEXgraf meets this need through simple operation and a resultant short learning curve. Hierarchical menu interface with many automatic functions in window technology as well as either-way conversion to the alphanumeric descriptive language NBS84 offers good conditions for capturing and modifying circuit plans and for outputting them both on screen and on plotters. Graphic or alphanumeric circuit editing may be chosen; positioning and drawing may be performed by the engineer himself or automatically by the editor.

A resolution of 1280 x 1024 pixels assures good recognition of the circuit elements and symbols. In addition to the comprehensive symbol library which is included, TEXgraf offers the capability of designing user-specific symbols. Circuit testing and representation of simulation results are in among the functions offered such as generation and modification of text, graphic elements, and colors. Within the framework of gate-array design systems such as ARCHIMEDES, the advantages of this graphic editor quickly become evident. TEXgraf may be used in connection with the K8919.11 terminal on a K1840 or a computer compatible to it.

With the transition to series production of the EC 1834, computer-aided development comes increasingly closer to the design workplace. With MultiCAD, the VEB Robotron Combine offers an efficient package developed for the DCP operating system.

Sketches are composed using the graphic elements point, line, circle, arc, strip, plane, text, and symbol; and it is possible, among other things, to alter their position, shape, and number. Sketches can be entered and edited interactively with menu control via both the graphics tablet and the keyboard. For three dimensional display, MultiCAD includes space lines and space planes. The grid models generated are displayed in parallel perspective and may be viewed from different directions.

A version of LISP has been integrated into MultiCAD, which on the one hand actually only contains part of the language range of LISP, but on the other hand has been enhanced by graphics functions. LISP provides the capability of generating user-defined commands and using them as if they were part of the system. For further processing, sketches may be converted into the IGES data format or into a data file.

An example of an optimum configuration for MultiCAD could consist of: EC 1834 (640-K RAM, 2 floppy drives, 1 hard disk, and 1 arithmetic processor), alphanumeric monitor, graphic monitor K7234 (color) or K7229.25 (monochrome), graphics tablet K6405, and plotter K6416.

An easy-to-understand menu and a tablet with pen and magnifier should support user-friendly work with PCCAD, an efficient, two-dimensional CAD system from the VEB Center for Applications Research (LfA) Berlin for 16-bit PC's.

Following a short learning period, manageable and supportive mathematical-geometric functions should assure professional work. The basic geometric symbols, such as point, line segment, arc, and body lines, can be expanded with additional application-specific symbols and can be stored; the basic design functions include connection of points, drawing of tangents, and bisecting of angles—accurately executed and drawn.

Sector-specific modules for mechanical engineering, electrical and electronics engineering, architecture, and geodesy are supplied in addition to the basic module and offer efficient design capabilities in conjunction with the 16-bit PC EC1834 and a color graphics monitor, a digitalized tablet, a plotter, and the DCP 3.2 operating system.

Sketch structuring is possible in as many as 128 levels for structuring, dimensioning, and cross-hatching or shading of a plane.

With CAD/CAM-NILES, the Machine Tool Manufacture Research Center and the Academy of Sciences of the GDR introduced a comprehensive computer-aided system which permits, in addition to design, elaboration of technology all the way to the programming of numerically controlled machine tools for production of bent parts from sheet steel. Increased flexibility and a clear reduction in part cycles with a simultaneous increase in productivity of NC programming and production are the significant performance characteristics. The individual sheet-metal parts may be captured, displayed, and combined as three-dimensional models. Visual control under mounted conditions (as 3D models) and derivation of partial views from the 3D model facilitate the work.

CAD/CAM-NILES permits control, conversion, and acceptance of geometry into the program system for technical preparation for production. The geometry

from the CAD system forms the basis for NC programming of the individual parts all the way to automated tool selection and optimization of process technology.

For the design of printed wire boards with the EC 1834, the ZFTN of the Information Electronics Combine (of the LfA) demonstrated the PCLES system. It permits graphic acquisition of the circuit diagram with logic or component symbols and creation of symbol and component lists, of transfer files for the transition to layout design, and of test plots for the circuit diagram. Furthermore, graphic design of the printed wire board profile, component positioning, manual and automatic line drawing in as many as 16 layers (a maximum of 1,900 lines), and output of control data for the light beam sketching as well as for the drilling machine and plotter are possible. The maximum printed wire board size is 65 x 65 cm (with 1/40" raster). The maximum of 511 components may occupy up to 256 pins each. Via connection to a K1840, the specific quantities of parts needed can be loaded to the hard disk of the PC from the uniform component catalog. [passage omitted]

Computer Technology

[Passage omitted] The Yugoslav firm Iskra Delta introduced a new DEC-compatible 32-bit computer in Leipzig. The ADRIA DOA-V31 has a MicroVAX II CPU from Digital Equipment Corporation (DEC), a floating point coprocessor, 1 MByte of RAM, a 335-MByte hard disk, a streamer, and a realtime clock. It was designed for a large variety of applications, such as realtime applications, office automation, and program development. It operates with an expanded Q-bus and uses the UNIX-compatible DELTA/V operating system. The ADRIA may be networked via an Ethernet-Q-bus interface. [passage omitted]

The Elektro-Apparate Werke "Friedrich Ebert" Berlin-Treptow was the first GDR firm to develop, with the P8000 Compact, a microcomputer with the new U80600 16-bit processor system. The P8000 Compact and the U80600 processor system have already been presented in detail in MICROPROZESSORTECHNIK No. 5/89.

GDR: Superconducting Quantum Interference Detector Developed

23020001p East Berlin SPECTRUM in German No 9 1989 p V

[Text] A joint effort among the Biomagnetic Measurements Laboratory of the Physics Department at Friedrich-Schiller-University and of the Physicotechnical Institute of the GDR Academy of Sciences, the University Clinic for Internal Medicine in Jena and the Academy-Central Institute for Heart and Circulatory System Research, Berlin-Buch, has resulted in the development of a thin-film superconducting quantum interference detector (SQUID) for measuring extremely weak magnetic fields. In terms of size, the device's dimensions are in the millimeter range. Without the necessity of direct contact, the SQUID can measure magnetic fields weaker than that of the earth by a factor of a billion.

The new device has entered small-scale series production. It has proven itself at scientific establishments in West Germany, Czechoslovakia, Finland, Hungary and the USSR. In conjunction with known technologies, the SQUID can be used for timely detection of cardiac infarctions and the symptoms that can lead to sudden cardiac death. Potentially, the device could prove beneficial for medical diagnosis in monitoring the magnetic activity of the human brain, liver, lungs and musculature. Other possible fields of application include nondestructive materials testing, mineral prospecting and high-temperature superconductor research.